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# **Results of Preliminary Investigations and Sampling in Proposed New Jersey Turnpike Right-of-Way at the Former Newark Drive-In Property Newark, New Jersey**

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*Submitted to:*

**New Jersey Turnpike Authority**

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## 1.0 INTRODUCTION

The Newark Drive-In Movie Theater Site is located between two identified hazardous waste sites. To the north there is the Bayonne Barrel and Drum Company facility, a former drum reconditioner subject to a consent order after having been identified by USEPA as an unlicensed hazardous waste storage facility. To the south lies the Ashland Chemical and Arkansas Chemical site identified by NJDEP as containing or suspected of containing hazardous wastes. The general area surrounding the Drive-In Movie Site is an industrial area with many other identified hazardous waste sites in close proximity. Therefore though the site's use as a movie theater did not make it subject to any hazardous waste regulations, it was determined prudent to undertake a minimal investigation to discover if any contamination is present at the site.

After this determination had been made but prior to commencing any investigation, excavation for a new theater building was witnessed and the existence of an underlying former landfill was noted.

The investigation undertaken was very limited with the sole intention of determining the existence or absence of contamination in the proposed Turnpike right-of-way. It was not intended at this stage to delineate the extent of contamination if it was found. In this regard there are no specific recommendations for further action appropriate at this time.

## 2.0 SITE DESCRIPTION

The Newark Drive-In Movie Site is located on Foundry Street, in Newark, N.J. (see Figure 1). It is bound by Foundry Street to the south, the Turnpike on the east and northeast, by Bayonne Barrel and Drum Company to the north, and on the west by US 1 and 9. Across Foundry Street there are a number of industrial properties including the aforementioned Ashland Chemical and Arkansas Chemical facilities. The property is in two lots, Block 5002, lots 11 and 12. The total site area is 19.2 acres.

Until it was disturbed by excavation, the site had been flat and covered in cinders with an asphalted perimeter road on the eastern and northeastern boundary. As a result of foundation work there are piles of material on the southwestern area of the site and an open pit, partly inundated on the northeastern area.

### 2.1 Site Characteristics

Current surface conditions at the former Newark Drive-In reflects a series of large crater-like depressions and mounds composed of demolition debris. These mounds and depressions are the result of the disruption of the Newark Drive-In for a planned multi-theater complex.

Most of the major disruptions took place in the northern half of the site with the southern half being more level. The deep depressions in the northern half allow for moderately rapid drainage of the southern portion into the depressions. Pondered water was evident most of the time in the depressions even during summer months with the water table being very close to the surface. There is no discernable drainage pattern to the site since the disruption occurred. Much of the mounded material consisted of large slabs of asphalt. Besides the asphalt the balance of the debris is mainly demolition material (brick, glass, cinders, sand, etc.). See Section 3.1 for a description of soil borings conducted in May 1985.

The Transco pipeline traverses the site along the extreme eastern boundary of the site. No structures, except for a chain-link fence and some wooden fences are present on the site.

### 2.2 Current Owner

The current owner of record of the site is Edle Realty Inc., c/o National Amusements, Inc.; 200 Elm Street, Dearborn, Massachusetts.

### 2.3 Current Status of the Property

The property is a closed down drive-in movie site from which all buildings and equipment have been removed. Work was commenced to excavate the northwestern portion of the site in the spring of 1986, ostensibly for a movie theater site. This work has since stopped and no work was being undertaken at the site during the time of sampling.

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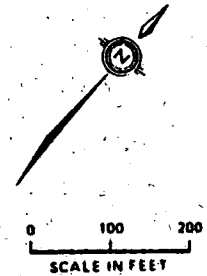
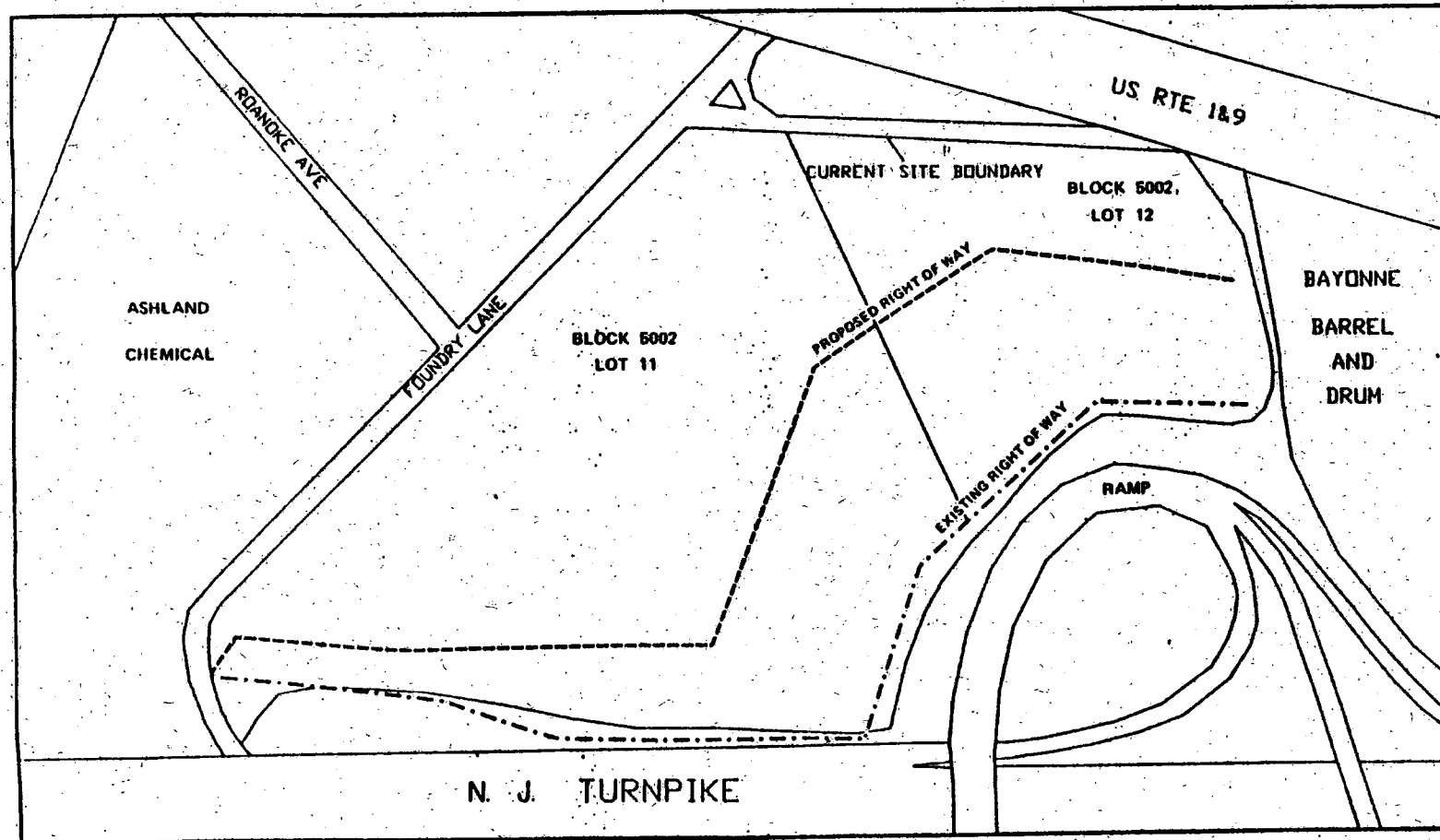


Figure 1  
GENERAL SITE MAP

## 2.4 Historical Use

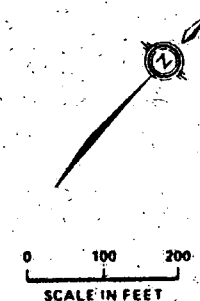
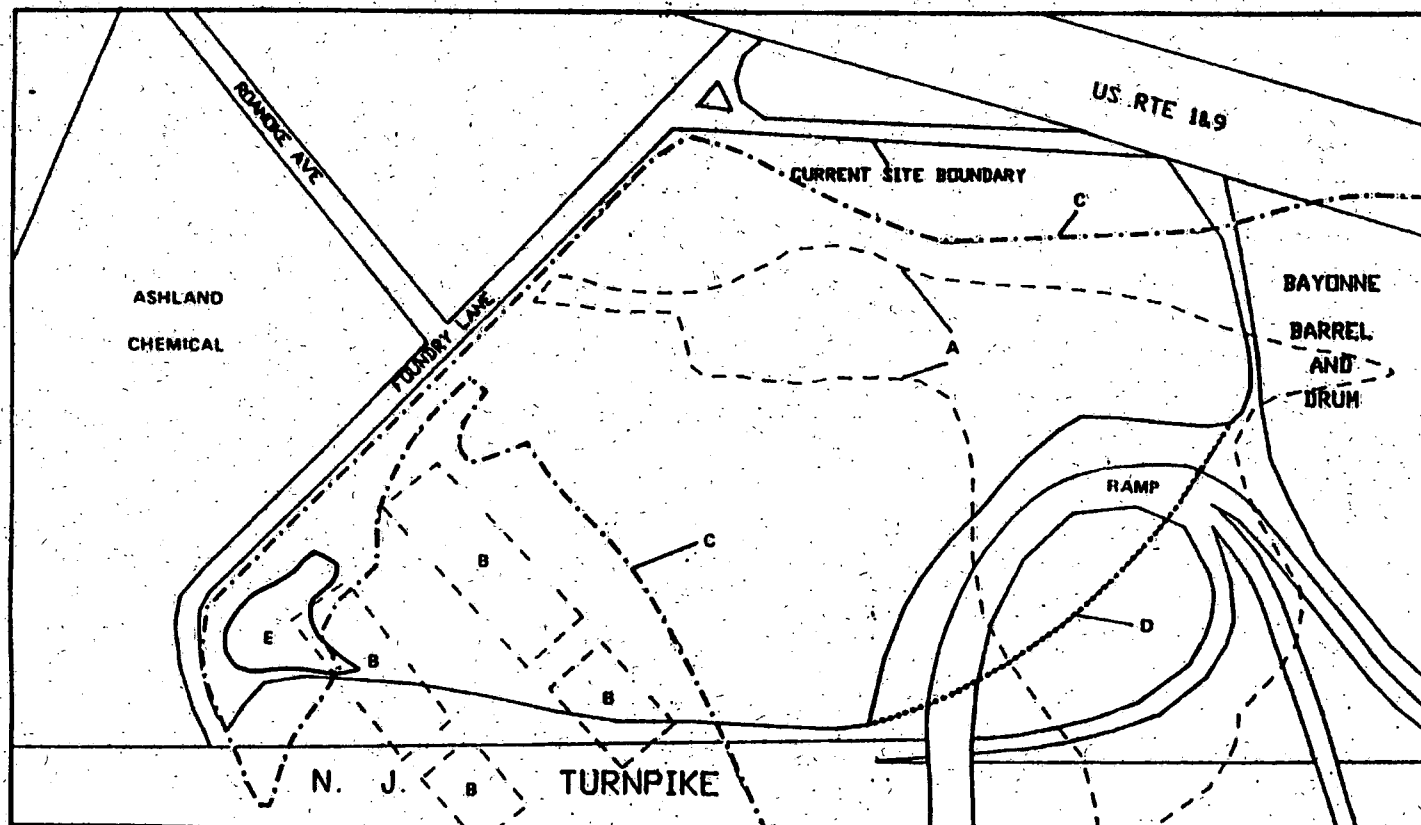
Historical maps and photos indicate that the Newark Drive-In Theater began operation between 1951 and 1959. Prior to that time much of the site was used as a landfill.

The site is situated in an area which is believed to have been part of the tidal marshes associated with the lower reaches of the Passaic River. At some time, the area appears to have been covered with fill possibly for use as a construction base for nearby roads and industries.

Aerial photographs from 1934 to 1985 document the physical changes at the site. Figure 2 graphically displays changes which may have impacted the site's present environmental setting. The following is a chronologic narrative outlining these changes.

- 1934 - Aerial photographs taken in 1934 (exact date is unknown) showed that the site was largely covered by fill. The fill had apparently been in place for sometime as revegetation had already occurred. A subsequent landfill operation was observed dumping solid waste material over a substantial portion of the northern half of the site (A). According to a 1931 Sanborn map of this area, the southern half portion of the site was occupied by the Jersey Feed Farms' pig pens. Four buildings (B) associated with that facility were noted.
- 1940 - Aerial photographs taken on April 6, 1940 showed the Jersey feed farms area to be abandoned with only the building foundations and outside pens visible. The landfill operation in the northern portion of the site was still active and expanding.
- 1947 - Aerial photographs taken on April 28, 1947 showed the landfill at its greatest areal extent (C).
- 1951 - By April 7, 1951, the landfill was inactive and construction of the adjacent Turnpike was underway.
- 1959 - Aerial photographs taken April 16, 1959 showed that a drive-in theater had been constructed at the site. Portions of the old landfill were visible outside the eastern edge of the drive-in, although substantial revegetation had occurred.
- 1985 - Aerial photographs taken on April 25, 1985 show that a ramp from the Turnpike had been constructed in an area which, in 1959, had been part of the drive-in's parking area (D). At the southern end of the site, a small area of ground appears to have been recently disturbed (E). This disturbance may be due to recent dumping.

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## LEGEND:

- A - APPROXIMATE LOCATION OF WASTE PILE (1934)
- B - 1934 PIGPENS JERSEY FEED FARMS
- C - EXTENT OF LANDFILL (1947)
- D - 1958 EXTENT OF DRIVE-IN AREA
- E - DISTURBED AREA (1985)

- 1934 INFORMATION
- - - - - 1947 INFORMATION
- ..... 1958 INFORMATION
- 1985 INFORMATION

Figure 2  
SITE HISTORY MAP



### 3.0 METHODS OF INVESTIGATION

The methods employed during this reconnaissance level investigation consisted of establishing site safety practices prior to working on the site; developing a sampling plan, and sampling methodology; and establishing a quality assurance program. The methods used were selected based upon their compliance with NJDEP recommended guidelines for hazardous waste site investigations.

#### 3.1 Site Safety Practices

A Site Safety Plan was developed prior to the commencement of any site activity, (refer to Appendix A). The Site Safety Plan establishes the policies and procedures that protect workers from the potential hazards posed by site investigative activities at a hazardous waste site. To minimize accidents and injuries that may occur during site activity, the plan addresses such practices as decontamination procedures, the use of personal protective equipment, and the type of air monitoring techniques employed during site operations.

##### 3.1.1 Air Quality Monitoring

During the initial site investigation it was necessary to determine whether or not the workers were exposed to an imminent hazard. To characterize the atmospheric conditions at the site various parameters were measured with the use of air monitoring equipment.

At the time of the initial reconnaissance, a walk-through inspection of the site was conducted, using direct-reading instruments to identify and quantify airborne contaminants. The investigators monitored for combustible gases, oxygen levels, radiation levels and total organic vapors at four locations around the site.

Radiation and oxygen levels were well within normal ranges. The combustible gas indicator did not detect the presence of any combustible vapors.

Total organic vapors were measured with an HNU model P-101 Photoionization Detector (PID). The analyzer is calibrated to benzene and reads out in deflection units or parts per million (ppm) relative to benzene. There were no organic vapors detected at this time.

During the installation of monitoring well #1, which occurred on 5/27/86, a Foxboro 128 Organic Vapor Analyzer (FID) was used to monitor the presence of organic vapors. Although organic vapor concentrations within the workers' breathing zone were nondetectable, there was a FID reading greater than 1,000 ppm detected at a depth of 18 inches during the boring of the well.

##### 3.1.2 Personnel Protection Equipment

The determination of protection levels was made by the Site Safety Officer. The information that aided him in making the decision was the air quality measurements, the type of work being performed and the visual evidence of known and suspected hazards.

Historically, there has been no evidence indicating the presence of hazardous materials at the site, nor were any detectable levels of organic vapors measured on the PID, therefore personnel were suited for Level D protection.

Personnel were dressed in Level D protection during all site activities except for the installation of monitoring well #1 when high levels of organic vapors were found in the borehole, at which time, they were in Level C protection.

### 3.1.3 Decontamination Procedures

When leaving a site all personnel were required to decontaminate themselves and dispose of all nonreusable equipment. Boots were scrubbed clean on site with soapy water and dried. Tyvek suits and gloves, and air cartridges and filters were disposed of in trash bags. Exposed skin was washed with soap and water. All wash water was disposed of on-site.

## 3.2 Sampling Plan

Sampling of soils and of groundwater was planned for the reconnaissance-level investigation conducted. The sampling locations for both soils and groundwater are shown on Figure 3. The soil sampling sites are designated by a five character alphanumeric code. The groundwater monitoring well is identified as MW1. Monitoring wells MW2 and MW3 are located on an area of the Bayonne Barrel and Drum property that is not addressed in this report. The rationale for sample locations and the methodology employed for soil sampling and for groundwater sampling are discussed in the following sections as well as the physical description of the material encountered during sampling.

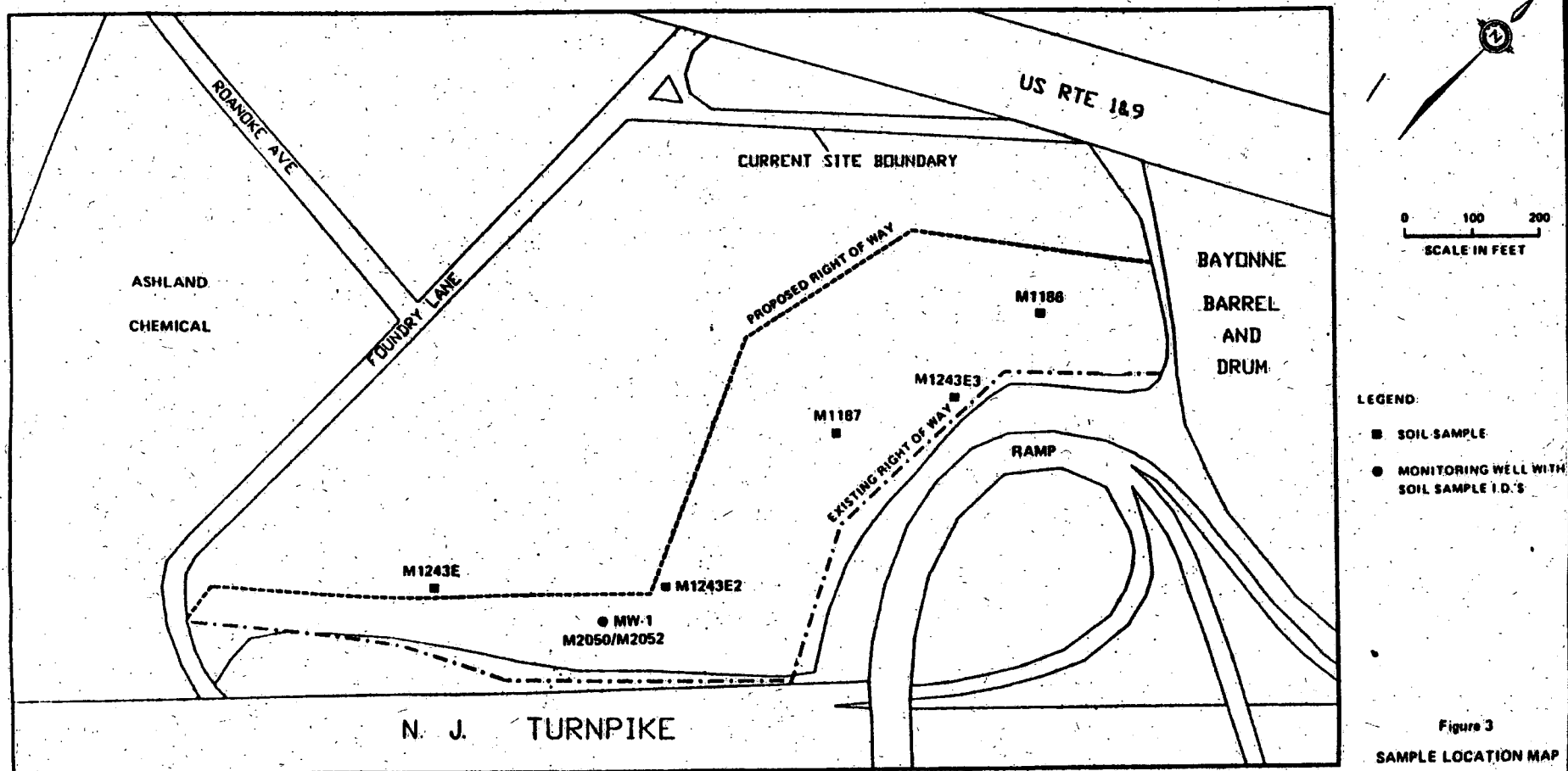
### 3.2.1 Soils

The determination of the soil sampling points was based on both random and biased sampling. Random sampling methodology was employed for the discrete samples that were taken and the composite sample locations were chosen by biased sampling. The random sampling methodology was performed by dividing the area at Newark Drive-In that is within the Turnpike's proposed right-of-way into a grid of 30 blocks, assigning numbers to each block, and then statistically selecting blocks for sampling point location by using a table of computer generated random numbers. When the number of matching numbers equalled the predetermined number of samples to be taken, the process was stopped.

The biased sample locations for the composite samples were selected due to site specific criteria: drainage, previous land use, and location of random samples. Nearly all surface and subsurface runoff within the proposed right-of-way flows to the depressions that dominate the eastern and northern portions of the site. Therefore, the biased samples were located so as to have this runoff intercepted by the soil borings.

The number of samples to be taken was the minimum considered necessary to determine the existence of contamination. It was decided to take 2

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discrete samples at one depth interval: 0-18 inches below land surface (b.l.s.). One composite sample, comprised of three (3) different sample locations at the same depth interval was also collected.

Discrete or grab samples are retrieved at a single point. Composite samples are samples comprised of two or more discrete samples taken at several different horizontal or vertical locations. The composite at the Newark Drive-In were taken at three different horizontal locations and composited in the laboratory where the analyses were performed.

Compositing is performed during site reconnaissance when the nature and the extent of the contamination is unknown. It allows for determining the general areal extent of contamination and the nature of the contamination without requiring extensive sampling. The disadvantages are that the compositing may reduce contaminant levels to safe levels. By diluting a contaminated sample with two relatively clean samples the source of contamination is unknown. Another disadvantage is that volatile chemicals in a sample are lost during the compositing process. Compositing is never used when point specific chemical data is needed. Therefore, by discriminately using both discrete and composite samples, the general areal nature and extent of the contamination was able to be assessed.

Discrete soil samples were also taken during installation of the monitoring wells at depths above the water table. It was decided to limit the number of samples analyzed to six from both the Bayonne Barrel & Drum and the Newark Drive-In Movie Site. Therefore, 18 and 24 inch samples were taken every five feet and examined. Based on this, the following two samples were analyzed and the remainder discarded. For monitoring well #1, two discrete samples were analyzed, both above the water table. The depths were 0-1.5 feet and 8-10 feet b.l.s., respectively. The boring logs for the monitoring well are presented in Appendix C.

#### 3.2.1.1 Sampling Methods

A split spoon was used to retrieve all soil samples, including those in the monitoring well boreholes. It is composed of carbide steel, and is 24 inches long with a 2-inch outer diameter. The method for collecting samples using the split spoon is as follows:

- a. Assemble the sampler by aligning both sides of the barrel and then screwing on the bit on the bottom and the heavier head piece on top.
- b. Place the sampler in a perpendicular position on the material to be sampled.
- c. Drive the sampler utilizing a sledge hammer (or a 140 lb. weight with a 30" drop when using the well rig for sampling in the boreholes).
- d. Record the length of the tube that penetrated the material (or the number of blows needed to reach that depth when using the well rig).

- e. Withdraw the sampler, and open it by unscrewing the bit and the head piece and then splitting the barrel.
- f. Record the physical description of the material and place it into the appropriate sample containers.
- g. Decontaminate the sampler using procedures outlined in Appendix B.

A description of materials encountered at each sample site are shown in Table 1.

#### 3.2.1.2 Sample Containers

Soil samples were taken from the sampler and placed in containers that have been determined by the U.S. Environmental Protection Agency (EPA) to be adequate for the types of analyses the sample is to undergo. These containers and the types of analyses they are appropriate for are defined by 40CFR136 for aqueous samples and USEPA's Manual of Test Methods for Evaluating Solid Waste (SW846, July 1982) for soil/sediment samples. The sample containers were prepared by Environmental Testing and Certification (ETC), the analytical laboratory used, and placed in preconfigured insulated and cooled shuttles.

#### 3.2.1.3 Contaminants to be Analyzed

The soil samples at Newark Drive-In were analyzed for 127 priority pollutants plus the next 40 highest peaks that were detected on the gas chromatograph. "Peak" is the parameter that defines concentration. By allowing for analysis of forty constituents that might have escaped detection if only target chemicals were specified, greater flexibility was incorporated into the analytical plan.

The term "priority pollutants" describes the pollutants' relative frequency of occurrence at potential hazardous waste sites, and represents a cross-section of inorganic and organic chemical groups. The 127 priority pollutants are the substances designated as toxic pollutants under Section 307(a)(1) of the Federal Clean Water Act (43 CFR 4108, January 1978), and are depicted in Table 2. In this table, NPDES is an abbreviation for National Pollutant Discharge and Elimination System. CAS stands for the Chemical Abstract Service, while MDL is the Minimum Detection Limit for each compound, measured in micrograms ( $10^{-6}$  grams) per liter.

#### 3.2.2 Groundwater

Samples of groundwater at the drive-in site were obtained from the one well, MW1, along the eastern boundary. The objective in locating this well was to ascertain whether groundwater contamination existed. Background conditions or the exact direction of groundwater flow could not be determined from the location of only one well. This information is not needed until contamination has been verified. If contamination is detected, then at a minimum, the installation of a upgradient well and one more downgradient well will be needed to determine its source.

Table 1  
SOIL BORING DESCRIPTIONS

<u>Boring No.</u>	<u>Depth (inches)</u>	<u>Soil Description</u>
M1186	0-6	Brown silt, friable, dry; trace fill (glass, white accretions)
	6-12	Brown sandy silt; dry, friable; some fill (black slag, grayish accretions)
	12-18	Fill (blackish brown woody fibers, decomposed brick, greenish smears and trace white accretions)
M1187	0-7	Poor recovery
	7-12	Grey and brown sand; some pebbles, dry, friable little sand accretions
	12-18	Moist black sand with black smears and fill (asphalt-like slag, blueglass, wood fibers, trace brick); distinct petroleum odor
M1243E	0-5	Fill (slag, trace silty)
	5-9	Fill (asphalt, slag, some silt)
	1-14	Same, little glass and silt
	14-18	Fill (cemented accretions, blue, white and gray)
M1234E2	0-5	Reddish brown silty sand with few pebbles, little greyish brown accretions
	5-15	black silt and fill (glass, slag) distinct petroleum odor
	15-18	Same, but some dense whitish crystalline deposits
M1243E3	0-4	No recovery
	4-10	Fill (yellowish accretions, slag, glass in brownish sandy silt matrix)
	10-15	Fill (bluish-black slag, silt, trace glass, brick and yellow accretions)
	15-18	Brown sandy silt and fill (slag, glass, yellow flakes, pebbles)

Table 2

## PRIORITY POLLUTANT LIST

## I. VOLATILE PARAMETERS

<u>NPDES Number</u>	<u>CAS Number</u>	<u>Compound</u>	<u>MDL (ug/l)</u>
1V	107-02-8	Acrolein	150
2V	107-13-1	Acrylonitrile	100
3V	71-43-2	Benzene	4.4
4V	542-88-1	bis(Chloromethyl)ether	10
5V	75-25-2	Bromoform	4.7
6V	56-23-5	Carbon tetrachloride	2.8
7V	108-90-7	Chlorobenzene	6.0
8V	124-48-1	Chlorodibromomethane	3.1
9V	75-00-3	Chloroethane	10
10V	110-75-8	2-Chloroethylvinyl ether	10
11V	67-66-3	Chloroform	1.6
12V	75-27-4	Dichlorobromomethane	2.2
13V	75-71-8	Dichlorodifluoromethane	10
14V	75-34-3	1,1-Dichloroethane	4.7
15V	107-06-2	1,2-Dichloroethane	2.8
16V	75-35-4	1,1-Dichloroethylene	2.8
17V	78-87-5	1,2-Dichloropropane	6.0
18V	542-75-6	cis-1,3-Dichloropropylene	5.0
19V	100-41-4	Ethylbenzene	7.2
20V	74-83-9	Methyl bromide	10
21V	74-87-3	Methyl chloride	10
22V	75-09-2	Methylene chloride	2.8
23V	79-34-5	1,1,2,2-Tetrachloroethane	6.9
24V	127-18-4	Tetrachloroethylene	4.1
25V	108-88-2	Toluene	6.0
26V	156-60-5	1,2-Trans-dichloroethylene	1.6
27V	71-55-6	1,1,1-Trichloroethane	3.8
28V	79-00-5	1,1,2-Trichloroethane	5.0
29V	79-01-6	Trichloroethylene	1.9
30V	75-69-4	Trichlorofluoromethane	10
31V	75-01-4	Vinyl Chloride	10

## II. ACID PARAMETERS

1A	95-57-8	2-Chlorophenol	3.3
2A	120-83-2	2,4-Dichlorophenol	2.7
3A	105-67-9	2,4-Dimethylphenol	2.7
4A	534-52-1	4,6-Dinitro-o-cresol	24
5A	51-26-5	2,4-Dinitrophenol	42
6A	88-75-5	2-Nitrophenol	3.6
7A	100-02-7	4-Nitrophenol	2.4
8A	59-50-7	p-Chloro-m-cresol	3.0
9A	87-86-5	Pentachlorophenol	3.6
10A	108-95-2	Phenol	1.5
11A	88-06-2	2,4,5-Trichlorophenol	2.7

Table 2 (continued)

## III. BASE NEUTRAL PARAMETERS

NPDES Number	CAS Number	Compound	MDL (ug/l)
1B	83-32-9	Acenaphthene	1.9
2B	208-96-8	Acenaphthylene	3.5
3B	120-12-7	Anthracene	1.9
4B	92-87-5	Benzidine	44
5B	56-55-3	Benzo(a)anthracene	7.8
6B	50-32-8	Benzo(a)pyrene	2.5
7B	205-99-2	3,4-Benzofluoranthene	4.8
8B	191-24-2	Benzo(ghi)perylene	4.1
9B	207-08-9	Benzo(k)fluoranthene	2.5
10B	111-91-1	bis(2-Chloroethoxy)methane	5.3
11B	111-44-4	bis(2-Chloroethyl)ether	5.7
12B	39638-32-9	bis(2-Chloroisopropyl)ether	5.7
13B	117-81-7	bis(2-Ethylhexyl)phthalate	2.5
14B	101-55-3	4-Bromophenyl phenyl ether	1.9
15B	85-68-7	Butyl benzyl phthalate	2.5
16B	91-58-7	2-Chloronaphthalene	1.9
17B	7005-72-3	4-Chlorophenyl phenyl ether	4.2
18B	218-01-9	Chrysene	2.5
19B	53-70-3	Dibenzo(a,h)anthracene	2.5
20B	95-50-1	1,2-Dichlorobenzene	1.9
21B	541-73-1	1,3-Dichlorobenzene	1.9
22B	106-46-7	1,4-Dichlorobenzene	4.4
23B	91-94-1	3,3'-Dichlorobenzidine	16.5
24B	84-66-2	Diethyl phthalate	1.9
25B	131-11-3	Dimethyl phthalate	1.6
26B	84-74-2	Di-n-butyl phthalate	2.5
27B	121-14-2	2,4-Dinitrotoluene	5.7
28B	606-20-2	2,6-Dinitrotoluene	1.9
29B	117-84-0	Di-n-octyl phthalate	2.5
30B	122-66-7	1,2-Diphenylhydrazine	10
31B	206-44-0	Fluoranthene	2.2
32B	86-73-7	Fluorene	1.9
33B	118-71-1	Hexachlorobenzene	1.9
34B	87-66-3	Hexachlorobutadiene	0.9
35B	77-47-4	Hexachlorocyclopentadiene	10
36B	67-72-1	Hexachloroethane	1.6
37B	193-39-5	Indeno(1,2,3-c,d)pyrene	3.7
38B	78-59-1	Isophorone	2.2
39B	91-20-3	Naphthalene	1.6
40B	98-95-3	Nitrobenzene	1.9
41B	62-75-9	N-Nitrosodimethylamine	10
42B	621-64-7	N-Nitrosodi-n-propylamine	10
43B	86-30-6	N-Nitrosodiphenylamine	1.9
44B	85-01-8	Phenanthrene	5.4
45B	129-00-0	Pyrene	1.9
46B	120-82-1	1,2,4-Trichlorobenzene	1.9



Table 2 (continued)

## IV. PESTICIDE PARAMETERS

<u>NPDES Number</u>	<u>CAS Number</u>	<u>Compound</u>	<u>MDL (ug/l)</u>
1P	309-00-2	Aldrin	1.9
2P	319-84-6	Alpha-BHC	10
3P	319-85-7	Beta-BHC	4.2
4P	58-89-9	Gamma-BHC	10
5P	319-86-8	Delta-BHC	3.1
6P	57-74-9	Chlordane	10
7P	50-29-3	4,4'-DDT	4.7
8P	72-55-9	4,4'-DDE	5.6
9P	72-54-8	4,4'-DDD	2.8
10P	60-57-1	Dieldrin	2.5
11P	115-29-7	Endosulfan I	10
12P	115-29-7	Endosulfan II	10
13P	1031-07-8	Endosulfan sulfate	5.6
14P	72-20-8	Endrin	10
15P	7421-93-4	Endrin aldehyde	10
16P	76-44-2	Heptachlor	1.9
17P	1024-57-3	Heptachlor epoxide	2.2
18P	53469-21-9	PCB-1242	36
19P	11097-69-1	PCB-1254	36
20P	11104-28-2	PCB-1221	30
21P	11141-16-5	PCB-1232	36
22P	12672-29-6	PCB-1248	36
23P	11096-82-5	PCB-1260	36
24P	12674-11-2	PCB-1016	36
25P	8001-35-2	Toxaphene	10

## V. METAL PARAMETERS

1M	7440-36-0	Antimony, Total	32
2M	7440-38-2	Arsenic, Total	1.0
3M	7440-41-7	Beryllium, Total	0.3
4M	7440-43-9	Cadmium, Total	4.0
5M	7440-47-3	Chromium, Total	7.0
6M	7550-50-8	Copper, Total	6.0
7M	7439-92-1	Lead, Total	42
8M	7439-97-6	Mercury, Total	0.2
9M	7440-02-0	Nickel, Total	15
10M	7782-49-2	Selenium, Total	2.0
11M	7440-22-4	Silver, Total	7.0
12M	7440-28-0	Thallium, Total	1.0
13M	7440-66-6	Zinc, Total	2.0

## VI. CONVENTIONALS

14M	57-12-5	Cyanide, Total	20
15M	-----	Phenols, Total	50

Courtesy of USEPA 1985

### 3.2.2.1 Monitoring Well Installation

The installation of monitoring well #1 was performed in accordance with NJDEP's Bureau of Groundwater Management recommended procedures. Though not required for this investigation, adhering to these procedures will help to insure the well's acceptance as a New Jersey Pollutant Discharge Elimination System (NJPDDES) monitoring well, should the site prove to have contaminated groundwater. A NJPDDES permit is required by owners/operators of sites that have the potential to be discharging effluent (i.e., contaminated leachate) to the groundwater.

The borehole for installation of the monitoring well was made by a hollow stem auger attached to a well rig. The auger was steam cleaned prior to use. It was scaled with chalk to every 6 inches to determine the sample depth. Samples were taken at the last two feet of every 5 foot interval but only two samples (0-1.5 feet and 8-10 feet) were analyzed for full priority pollutants. The results of the boring logs for the monitoring well are in Table 4 and Appendix C. The borehole had distinct petroleum odors with significant amounts of petroleum coated fill.

Approximate depth of hole and depth to water table were measured using a weighted string. The boring was made to approximately 10 feet below the water table. After the hole was bored to the desired depth, the augers were disconnected from the rig but left in the hole to support the sidewalls. The hole was flushed clean of soil cuttings using a roller bit and pressurized potable water. The flushing operation ceased when the water discharging from the hole was clean. The roller bit was then removed from the hole, and the well screen installed into the borehole with the hollow stem auger still in place. The 4 inch O.D. (outer diameter) PVC well screen had a plastic cap attached to its bottom and was threaded into a 4 inch O.D. well casing at its top before placing it into the borehole. The top of the casing rose to approximately two feet above the ground surface. The area between the borehole walls and the well screen (the annular space) was filled with #2 Morie sand to maintain a good hydraulic connection between the aquifer material and the well screen. The auger was slowly lifted out of the borehole as the annular space was being filled. Eventually the auger was removed and the sand was emplaced until it was 6-12 inches above the well screen. A bentonite/cement grout was then injected into the hole until it was flush with the ground surface, and a 6" O.D. steel casing placed over the inner casing and set into the sealant (bentonite/cement mixture). Next, the steel casing was locked and security posts were placed around the well. All materials and specifications for monitoring well #1 are detailed in Appendix C along with the permit from the Bureau of Water Allocation. A detailed soil boring description is presented in Table 3.

### 3.2.2.2 Well Development

Well development took place soon after installation of the well, in order to create a good hydraulic connection between the aquifer and the well screen. Development of a monitoring well can be accomplished by a variety of methods and equipment. A well is satisfactorily developed when pumping the well yields a sand-free discharge at a consistent pump rate.

Table 3  
BORING LOG OF MONITORING WELL 1

<u>Boring No.</u>	<u>Depth (feet)</u>	<u>Soil Description</u>
M2050	0-0.5	Brown silt, moist, dense with 20% pebbles; and fill (miscellaneous); trace clay
	0.5-1.0	Same with more fill (asphalt-like material, glass, brick); distinct petroleum odor
	1.0-1.5	Dry brown silt and fill (dense black asphalt-like material; slag, brick, yellow white particles on asphalt surface)
	3.0-4.0	moist black silt, friable with trace fill (tarry material); distinct petroleum odor
	4.0-4.5	Same but some dense oil covered silt and little construction debris (decomposed brick, slag and glass)
M2052	8-8.5	Dense, friable black silt, moist; some fill (glass); distinct petroleum odor
	8.5-9.0	Fill (coarse gravel, pebbles, multicolored undifferentiated waste), moist
	9.0-10.0	Fill (glass, pebbles, tar, paint chips, concretions of slag and brick); distinct petroleum odor
	13-14	Gray-brown silt clay coated with oily leachate, red streaks, very sticky, very plastic
	14-14.5	Same with oily smears but no red streaks
	14.5-15.0	Brown clay with some silt and sand grading to a sandy clay, rust streaks; weak petroleum odor

Table 4

## FIELD MEASUREMENTS OF GROUNDWATER MONITORING WELL #1

Date	5/27/86
Time	3:50 P.M.
Water Level (above msl)	4.60 ft.
pH	7.56
Salinity	1,000 mg/l
Conductivity	1,600 micromhos/cm

Immiscible Layers

Light Phase	none detectable
Dense Phase	none detectable

Total Organic Vapors	700 ppm
Total Organic Carbon	47.8 mg/l

Monitoring well #1 was developed with a hand bailer until the well went dry which occurred quite rapidly. Its discharge was extremely turbid but did not contain much sand, mainly salt.

### 3.2.2.3 Groundwater Sampling

Seven days after the well was developed, but prior to sampling for chemical analyses, samples were collected and tested for total organic carbon (TOC), and if turbid, for grain size distribution of the sediment. (Measuring these constituents is recommended by the USEPA for assessing the integrity of monitoring well installation and development on RCRA sites.)

The water was purged from the well using a bladder pump with a check valve for regulating discharge. The purge water for sediment size distribution was collected in glass containers, while the TOC samples were collected in the appropriate container and preserved. All containers and preservatives used for storing groundwater samples after collection were laboratory cleaned and composed of materials appropriate for the intended analyses in accordance with 40 CFR 136. The analyses for both parameters were performed the next day. The results of the grain size distribution and TOC analyses, 47.8 mg/l, indicated that the majority of the purge water was silt, clay and organic material with very little sand.

Samples for chemical analyses were collected from the monitoring well after evacuating a minimum of 3 times the volume of standing water in the well with a bladder pump. This was to insure that only fresh, nonstratified aquifer water was being sampled. The polyethylene tubing placed into the well for evacuation was dedicated to that well only. The depth to water and the depth of the well were measured before sampling to determine the volume of water in the well using an oil/water interface meter.

Prior to and after evacuation of the well, field measurements were taken of several parameters that are usually considered controlling variables of the chemical speciation found in water quality analysis. The parameters are also signatures of the water that help determine whether the water recovered in the well is stable after evacuation, compared to the water previous to evacuation. The results of the field measurements are presented in Table 4. These parameters and the methods for measuring them are as follows:

- pH - A measure of the hydrogen ion concentration in the water. Measured with a Beckman 21 pH meter calibrated in the field with standard pH solutions of 4 and 7. Initial pH's were taken of water pumped from the well during purging (evacuation) and of the water collected from sampling. Water samples used for measuring pH were not kept for further chemical analyses.
- Salinity - Measures the total salt content in the water to determine whether it is fresh, brackish or saline. Measured in each borehole before purging and after sampling with a YSI #33 S-C-T meter. The well water was not saline.

- Conductivity - An indirect measure of the total dissolved solids in solution. The measurements are in micromhos/cm, a unit indicating the conductivity of the solution and therefore a measure of all ionized species. The micromhos units can be converted to mg/l of total dissolved solids by using a conversion factor (0.55 to 0.90) that is based on the source of the water and the types of charged chemical species that dominate the solution. Conductivity was measured the same way as salinity.
- Temperature - Measured in each borehole prior to purging but after sampling using the YSI S-C-T meter.
- Immiscible Layer Measurements - Immiscible layers are concentrations of organic liquids that are insoluble in water and therefore form a distinct layer above the water table and/or at the bottom of a borehole. Where layers of either light or dense phase immiscibles are detected, separate samples of these layers will be taken. These measurements were made prior to purging and just before sampling with an oil/water interface sounding probe (Oil Recovery Systems - Interface Meter, Model 100EN/M) that transmits a steady beep when hitting an immiscible layer and in intermittent beep when in water.

Measurements in monitoring well #1 indicated no distinct immiscible layers.

- Depth to water and depth of well measurements were made during development of the well, prior to evacuation, during recovery of the well and before and after sampling using the oil/water interface probe. Measurements were made to the nearest 0.01 foot.

All sampling of groundwater was performed using a 36 inch long, teflon coated, single-bottom, check-valve bailer dedicated to the well. It was cleaned by the laboratory doing the chemical analyses and wrapped in autoclaved tinfoil. The wire used to rinse and lower the bailer was also teflon coated. The sampling procedures were as follows:

- a) The well was allowed to recover after purging, and sampling began when the water had risen to within 0.1 feet of water level prior to purging.
- b) The bailer was removed from tinfoil, tied to teflon coated wire which was connected to a circular spindle, and lowered into the well.
- c) Volatile organics (VOA's) were sampled first by lowering the bottom of the bailer until it was entirely submerged below the water surface so as to sample any light phase immiscibles. Extreme care was taken when lowering and raising the bailer so as not to degas the sample. The sample was then transferred into the sample container by pushing the ball check-valve located at the bottom of the bailer upward with a finger and allowing the water to flow into the container. No air bubble or head space was left in the VOA containers.

- d) The same method as (c) was used to collect samples for all other analyses but at depths in the well ranging from 18 to 48 inches below the water surface. Samples retrieved for metals analysis were first filtered through disposable 0.45 micrometer pore size cellulose acetate filters, and then stored in the appropriate containers and preserved. This is to minimize the effect that the sediment might have on the concentration of the metals in solution while the sample is awaiting analysis. The result of the analysis is reported as total dissolved metals.
- e) After a sample was collected, depth of water, salinity, conductivity and temperature were measured and recorded. After removal of all probes, the plastic cap was fitted to the top of the inner casing and the steel protective casing was locked.

The groundwater samples collected and preserved were analyzed for the 127 priority pollutants plus 40 peaks. A listing of the priority pollutants categories is provided in Table 2.

### 3.3 Quality Assurance

The chain of custody is a quality assurance/quality control (QA/QC) measure to provide for the integrity of the sampling and analytical process. Chain of custody procedures were carried out in accordance with NJDEP and USEPA guidelines. The chain of custody forms used for each sample are contained in Appendix B.

All data on types of chemicals and their levels reported by ETC Laboratories have been critically evaluated with respect to data acceptance criteria which include accuracy, precision, representativeness, completeness and reliability. The evaluation was done according to NJDEP's guidelines for these criteria.

The data were found to meet these criteria with a few exceptions and are presented in the enclosed tables. Those data which do not meet the above mentioned criteria for acceptance are flagged with USEPA's data qualifier code letters (see Table 6). The qualifier codes are annotated and the code letters with annotations written next to the qualified data. Definitions of codes are presented at the bottom of Table - showing related data. Thus, concentrations of analytes flagged with code "J" are to be considered estimated concentrations.

The samples were analyzed for 127 priority pollutants plus 40 peaks. Table 6 includes only those compounds which were "hits" in any of the samples. Compounds not detected in any sample are not included.

Data related to the volatile organic fraction meets our quality assurance criteria except for methylene chloride. Reported levels of methylene chloride are to be treated as estimated concentrations.

Data related to acids and base/neutral extractable compounds, metals, total phenolics and total cyanides meet acceptance criteria.

All concentrations reported for pesticides and PCB's are to be considered estimated concentrations. These compounds were found in the soil samples, but not in any of the water samples (see Table 6). The laboratory had difficulty in analyzing for these parameters due to matrix interference and had to repeat extraction and analyses. However, reextraction was done past the time limit allowed by NJDEP. The laboratory will obtain a decision from USEPA/NJDEP to allow acceptance of these results as valid. In the meantime these data could be used in characterization of the site.



#### 4.0 RESULTS OF ANALYSES AND CONCLUSIONS

Results of soil and water analyses of samples taken from the Newark Drive-In property are presented in Table 6. Table 5 depicts the cleanup level criteria used by the NJDEP's Bureau of Industrial Site Evaluation (BISE) to determine if a cleanup action should be taken. Newark Drive-In is currently not being investigated under any federal or state statute to our knowledge, but the BISE cleanup levels provide a measure against which the results may be judged. Many of the parameters do not have specific criteria to be judged by, but instead are included in the totals for a whole group of contaminants that have a single cleanup level. Other parameters, such as acid extractable organics in soils do not have any clean-up criteria. The location of the results that exceed the BISE cleanup levels are summarized in Figure 4, along with their respective parameters.

Specific levels for many of the parameters in the USEPA Priority Pollutant List (Table 2) for both soil and groundwater are currently being developed, and may be applicable to this site when they are approved in the Federal Register.

As noted in Section 3.3 all concentrations reported for pesticides and PCB's are to be considered estimated or provisional. The analysis procedures did not meet USEPA and NJDEP Quality Assurance requirements. However, for the purpose of general description of contamination at the site they are considered valid, as the infringement was of a technical nature.

##### 4.1 Soils

The soil samples included two discrete samples (M1186, M1187), one from each of two sites; a composite (M1243) of three samples taken from three sites and two soil samples from different depths from the monitoring well. The samples from the well were taken at 0-18" (M2050) and 8'-10' (M2052) depths.

All soil samples are characterized contaminated to levels above NJDEP-BISE's cleanup levels. This characterization is based primarily upon metal contaminants, particularly arsenic, cadmium, lead, mercury and zinc, all of which were present in all five soil samples in concentrations above BISE's cleanup levels. In addition to these metals chromium and copper were also found at high levels in samples M1243, M2050 and M2052. High levels of copper were also found in sample M1187. In the soil samples from the well, most of the metals were found in higher concentrations in the upper stratum (sample M2050) than lower stratum (M2052) indicating surficial nature of contamination with leaching down phenomenon. However, presence of only trace amounts in water indicate tight binding of metals to the soil particles, most likely in complex form.

Levels of volatile organic compounds were relatively low in all soil samples and, except for sample M1187, none contained total volatile organics above BISE's cleanup level. Even in the case of sample M1187, the

Table 5  
CLEANUP LEVELS USED BY BISE

A. <u>Soil</u>	<u>Concentration</u>
Arsenic	20 mg/kg
Barium	400
Cadmium	3
Chromium	100
Copper	170
Lead	100
Nickel	100
Mercury	1
Petroleum Hydrocarbons	100
Polychlorinated Biphenyls	1-5**
Silver	5
Selenium	4
Total Cyanides	12
Total Volatile Organics	1
Zinc	350
B. <u>Groundwater</u>	<u>Concentration</u>
Petroleum Hydrocarbons	1 mg/l
Total Volatile Organics	10 ug/l*
Total Base/Neutral Organics	50 ug/l*
Total Acid Extractable Organics	50 ug/l*
Others	See Groundwater Quality Standards

\*Lesser concentrations for specific chemicals may be utilized based upon 10<sup>-6</sup> cancer risk and/or other toxicologic factors.

\*\*USEPA does not regulate PCBs at concentrations of less than 50 mg/kg.

Table 5 (continued)

N.J.A.C. Groundwater Quality StandardsPrimary Statewide/Toxic Pollutants

Pollutant, Substance or Chemical	Groundwater Quality Criteria
1. Aldrin/Dieldrin	1. 0.003 ug/l
2. Arsenic and Compounds	2. 0.05 mg/l
3. Barium	3. 1.0 mg/l
4. Benzadine	4. 0.0001 mg/l
5. Cadmium and Compounds	5. 0.01 mg/l
6. Chromium (Hexavalent) and Compounds	6. 0.05 mg/l
7. Cyanide	7. 0.2 mg/l
8. DDT and Metabolites	8. 0.001 ug/l
9. Endrin	9. 0.004 ug/l
10. Lead and Compounds	10. 0.05 mg/l
11. Mercury and Compounds	11. 0.002 mg/l
12. Nitrate-Nitrogen	12. 10 mg/l
13. Phenol	13. 3.5 mg/l
14. Polychlorinated Biphenyls	14. 0.001 ug/l
15. Radionuclides	15. Prevailing regulations adopted by the USEPA pursuant to sections 1412, 1415 and 1450 of the Public Health Services Act as amended by the Safe Drinking Water Act (PL 93-523)
16. Selenium and Compounds	16. 0.01 mg/l
17. Silver and Compounds	17. 0.05 mg/l
18. Toxaphene	18. 0.005 ug/l

Secondary Standards

19. Ammonia	19. 0.5 mg/l
20. Chloride	20. Natural Background
21. Coliform Bacteria	21. a) by membrane filtration, not to exceed four per 100 ml in more than one sample when less than 20 are examined per month, or b) by fermentation tube, with a standard 10 ml portion, not to be present in three or more portions in more than one sample when less than 20 are examined per month, or c) prevailing criteria adopted pursuant to the Federal Safe Drinking Water Act (PL 93-523)

Table 5 (continued)

Primary Statewide/Toxic Pollutants

Pollutant, Substance or Chemical	Groundwater Quality Criteria
22. Color	22. None Noticeable
23. Copper	23. 1.0 mg/l
24. Fluoride	24. 2.0 mg/l
25. Foaming Agents	25. 0.5 mg/l
26. Iron	26. 0.3 mg/l
27. Manganese	27. 0.05 mg/l
28. Odor and Taste	28. None Noticeable
29. Oil and Grease and Petroleum Hydrocarbons	29. None Noticeable
30. pH (Standard Units)	30. 5-9
31. Phenol	31. 0.3 mg/l
32. Sodium	32. Natural Background
33. Sulfate	33. Natural Background
34. Total Dissolved Solids	34. Natural Background
35. Zinc and Compounds	35. 5 mg/l

Source: N.J.A.C. 7:9-6.6

Table 6

## Results of Analyses

Sample #	M 1186	M 1187	M 1243	M 2050	M 2052	M 1218
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L
Date of Submission	25-Apr	25-Apr	25-Apr	07-May	07-May	27-May
Location	G-1	G-2	COMP	WELL #3	WELL #3	WELL #3
Depth	0-18"	0-18"	0-18"	0-18"	8-10'	
Composite/Discrete	D	D	C	D	D	D
Soil/Water	S	S	S	S	S	W
<b>VOLATILE ORGANICS</b>						
<b>Priority Pollutants</b>						
Benzene	ND	220	ND	1.6	ND	ND
Ethylbenzene	ND	131	ND	1.8	ND	ND
Methylene chloride	84	40	184	ND UJ2	ND UJ3	ND UJ1
Toluene	ND	245	8	ND	ND	ND
Totals	84	636	192	3.4	0	0
<b>Volatile Organics, Additional Peaks (Semi-Quantitative)</b>						
2-Propanone	29	ND	ND	ND	ND	
2-Propanone	ND	ND	ND	ND	ND	
Dimethyl Benzene	ND	981	ND	ND	ND	
<b>ACID EXTRACTABLES</b>						
2,4-Dimethylphenol	ND	ND	ND	3,200	ND	ND
Phenol	ND	ND	ND	430	ND	ND
<b>BASE/NEUTRAL EXTRACTABLES</b>						
Acenaphthene	ND	74,400	11,000 J	2,710	3,660	ND
Acenaphthylene	2,100	30,800	3,000 J	BMDL	1,430	ND
Anthracene	8,240	18,600	14,000 J	4,820	8,350	ND
Benzidine	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	14,200	23,180	30,200 J	12,100	9,250	ND
Benzo(a)pyrene	11,500	150,000	49,000 J	13,400	12,900	ND
Benzo(b)fluoranthene	7,300	214,100	60,100 J	20,500	14,300	ND
Benzo(ghi)perylene	7,200	101,800	33,500 J	6,670	7,560	ND
bis(2-Ethylhexyl)phthalate	940	ND	ND	2,540	13,500	ND
2-Chloronaphthalene	ND	ND	4,300 J	ND	ND	ND
Chrysene	17,000	21,060	31,100 J	11,900	9,760	ND
Dibenzo(a,h)anthracene	1,500	79,650	9,700 J	2,360	1,910	ND
Di-n-butyl phthalate	ND	ND	2,900 J	BMDL	1,040	ND
Fluoranthene	24,700	348,000	47,400 J	20,600	11,600	ND
Fluorene	13,900	292,000	16,000 J	BMDL	12,900	ND
Indeno(1,2,3-c,d)pyrene	5,100	62,830	23,700 J	5,370	4,930	ND
Naphthalene	36,500	790,000	28,200 J	3,520	28,600	ND
Phenanthrene	54,000	822,000	52,400 J	15,600	35,200	ND
Pyrene	38,700	472,000	61,600 J	26,000	15,200	ND
Totals	242,880	3,500,420	478,100	148,090	192,090	0

J-Estimated concentrations; two surrogates out of control limits.

UJ1-Estimated quantitation limit 11.7 ug/l

UJ2-Estimated quantitation limit 4.2 ug/kg

Table 6 (continued)

Sample #	M1186	M1187	M1243	M2050	M2052	M1218
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L
Date of Submission	25-Apr	25-Apr	25-Apr	07-May	07-May	27-May
Location	G-1	G-2	COMP	WELL #3	WELL #3	WELL #3
Depth	0-18"	0-18"	0-18"	0-18"	8-10'	
Composite/Discrete	D	D	C	D	D	D
Soil/Water	S	S	S	S	S	W

## Base/Neutral/Acid Extractables, Additional Peaks (Semi-Quantitative)

Parameter	M1186	M1187	M1243	M2050	M2052	M1218
14-Benzo(B)Fluorene	ND	81,700	ND	ND	ND	ND
1-Methyl Anthracene	ND	128,000	ND	ND	ND	ND
1.1'-Biphenyl	ND	ND	ND	ND	241	ND
1.1-Biphenyl	ND	93,100	ND	ND	ND	ND
2-Ethyl Naphthalene	ND	ND	8,190	ND	ND	ND
2-Methyl 1.1-Biphenyl	ND	94,300	ND	ND	ND	ND
2-Methyl Anthracene	ND	51,500	ND	ND	ND	ND
2-Methyl Anthracene	9,580	ND	ND	ND	ND	ND
2-Methyl Naphthalene	12,100	ND	ND	ND	ND	ND
2-Methyl Naphthalene	ND	ND	15,400	ND	ND	ND
2-Methyl Phenanthrene	9,330	ND	ND	ND	ND	ND
3-Methyl Phenanthrene	ND	194,000	ND	ND	ND	ND
4-Methyl Phenanthrene	ND	106,000	ND	ND	ND	ND
4-Methyl Phenanthrene	ND	ND	7,550	ND	ND	ND
Alkane	ND	ND	9,360	ND	ND	ND
Alkane	ND	ND	ND	ND	412	ND
Alkane	7,890	ND	ND	ND	ND	ND
Cyclohexene, Pentyl	7,610	ND	ND	ND	ND	ND
Dibenzothiophene	ND	ND	ND	ND	305	ND
Diethyl Benzene	ND	ND	ND	ND	276	ND
Dimethyl 2-Pentene	ND	ND	ND	2,830	ND	ND
Dimethyl Naphthalene	ND	ND	ND	3,700	ND	ND
Dimethyl Naphthalene	26,000	ND	ND	ND	ND	ND
Dimethyl Naphthalene	ND	ND	ND	ND	3,037	ND
Dimethyl Naphthalene	ND	854,000	ND	ND	ND	ND
Dimethyl Naphthalene	ND	ND	24,500	ND	ND	ND
Dimethyl Phenanthrene	ND	109,000	ND	ND	ND	ND
Dimethyl Phenanthrene	7,720	ND	ND	ND	ND	ND
Dimethyl Phenol	ND	ND	ND	1,570	ND	ND
Ethyl Naphthalene	ND	58,100	ND	ND	ND	ND
Ethyl-Dimethyl Benzene	ND	ND	ND	ND	364	ND
Ethyl-Methyl Benzene	ND	ND	6,470	ND	ND	ND
Ethyl-Methyl Benzene	ND	ND	ND	1,770	ND	ND
Ethyl-Methyl Benzene	ND	49,600	ND	ND	ND	ND
Ethyl-Methyl Benzene	ND	ND	ND	ND	940	ND
Methyl 9H-Fluorene	ND	ND	ND	ND	373	ND
Methyl Anthracene	ND	ND	ND	ND	927	ND
Methyl Benzene	ND	ND	ND	1,670	ND	7
Methyl Fluorene	ND	184,900	ND	ND	ND	ND
Methyl Naphthalene	ND	1,170,000	ND	ND	ND	ND
Methyl Naphthalene	ND	ND	ND	6,780	ND	ND
Methyl Naphthalene	20,000	ND	ND	ND	ND	ND

Table 6 (continued)

Sample #	M 1186	M 1187	M 1243	M 2050	M 2052	M 1218
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L
Date of Submission	25-Apr	25-Apr	25-Apr	07-May	07-May	27-May
Location	G-1	G-2	COMP	WELL #3	WELL #3	WELL #3
Depth	0-18"	0-18"	0-18"	0-18"	8-10'	
Composite/Discrete	D	D	C	D	D	D
Soil/Water	S	S	S	S	S	W
Methyl Naphthalene	ND	ND	ND	ND	4,150	ND
Methyl Naphthalene	ND	ND	27,900	ND	ND	ND
Methyl Phenanthrene	10,500	ND	ND	ND	ND	ND
Methyl Phenanthrene	ND	ND	ND	ND	569	ND
Methyl Phenol	ND	ND	ND	6,190	ND	ND
Methyl-Methyl Ethyl Benzene	ND	ND	ND	ND	440	ND
Naphthalene, Decahydro, Trans	10,000	ND	ND	ND	ND	ND
Naphthalene, Decahydro, Trans	ND	ND	7,290	ND	ND	ND
Propyl Benzene	ND	ND	ND	0	353	ND
Tetramethyl Benzene	ND	ND	6,990	ND	ND	ND
Tetramethyl Benzene	ND	ND	ND	2,040	ND	ND
Trimethyl Benzene	ND	ND	6,120	ND	ND	ND
Trimethyl Naphthalene	ND	210,000	ND	ND	ND	ND
Trimethyl Naphthalene	ND	ND	ND	ND	627	ND
Xylene	ND	ND	6,810	ND	ND	ND
Xylene	ND	ND	ND	ND	236	ND
TOTAL PHENOLICS AND CYANIDES						
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/L
Phenolics, Total	0.32	0.63	0.08	2.80	1.5	<.05
Cyanide, Total	0.75	4.4	15	1.1	1.2	<.025
PCB						
UNITS	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L
Aroclor 1254	18,000 J1	ND	ND	ND	ND	ND
Aroclor 1260	ND	ND	ND	23000 J1	ND	ND
METALS						
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	ug/L
Antimony	1.7	1.4	5.6	15	6.7	3.1
Arsenic	26	1,200	25	760	46	2
Beryllium	0.11	0.46	0.46	0.6	0.44	ND
Cadmium	4	3.2	33	18	12	0.83
Chromium	43	60	860	240	240	1.4
Copper	91	250	2,560	690	530	7.8
Lead	1,390	740	4,100	3,000	1,840	ND
Mercury	2.4	1.3	3.7	3.9	11.1	ND
Nickel	38	120	340	120	73	ND
Selenium	ND	ND	ND	1.8	ND	ND
Silver	1.2	1.2	2.9	3.3	1.4	ND
Thallium	ND	0.14	0.63	0.26	0.29	ND
Zinc	500	2,120	2,830	2,190	1,900	29

J1- Estimated concentration; sample reextracted past holding time allowed under 40 CFR part 136

Table 6 (continued)

Sample #	M 1186	M 1187	M 1243	M 2050	M 2052	M 1218
Units	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/L
Date of Submission	25-Apr	25-Apr	25-Apr	07-May	07-May	27-May
Location	G-1	G-2	COMP	WELL #3	WELL #3	WELL #3
Depth	0-18"	0-18"	0-18"	0-18"	8-10'	
Composite/Discrete	D	D	C	D	D	D
Soil/Water	S	S	S	S	S	W

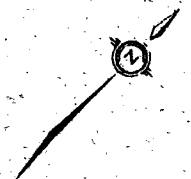
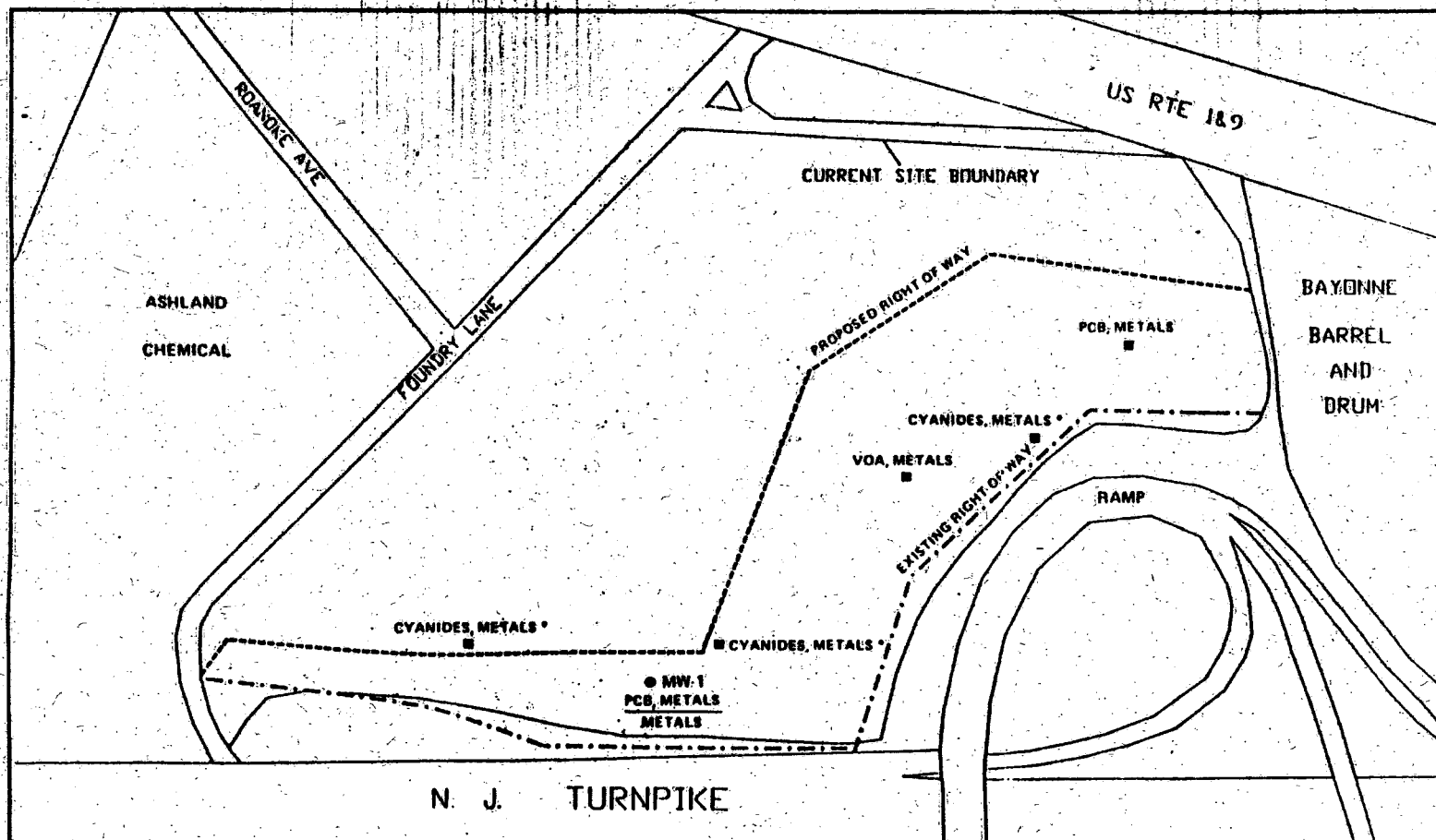
## PESTICIDES

4,4'-DDT	ND	ND	ND	ND	3000 J1	ND
4,4'-DDE	ND	ND	2,900 J1	ND	610 J1	ND
4,4'-DDD	ND	ND	ND	ND	1500 J1	ND
Endrin aldehyde	ND	530 J1	ND	ND	ND	ND
Heptachlor epoxide	ND	2,800 J1	840 J1	ND	ND	ND

J1-Estimated concentration; sample reextracted past holding time allowed under 40 CFR part 136



# NEWARK DRIVE-IN



0 100 200  
SCALE IN FEET

## LEGEND

- SOIL SAMPLE
- MONITORING WELL WITH SOIL SAMPLE I.D.'S

Figure 4  
POINTS ABOVE  
ECRA CLEANUP LEVEL

• Composite Sample  
 •• METALS indicates excessive of 3 or more metals, otherwise specific metals are shown.

level of total priority pollutant volatile organics remained at 0.6 mg/kg which is below BISE's cleanup level of 1.0 mg/kg for total volatile organics. However, when concentrations of additional peaks (volatile organic compounds other than those on the list for 127 priority pollutants) are added, sample M1187 contained 1.617 mg/kg of total volatile organics, which is above the BISE's cleanup level. The data is only semiquantitative with respect to additional peaks.

Only one soil sample (M2050) contained detectable levels of acid extractable compounds (phenols); the others did not.

All five soil samples contained relatively high levels of base/neutral extractable organic compounds. The concentration of priority pollutant compounds ranged between 148 mg/kg (M2050) to 478 mg/kg (M1243). The discrete and composited soil samples had higher concentrations than those taken from the monitoring well. These compounds are comprised mostly of polynuclear aromatic hydrocarbons, especially naphthalene, phenanthrene, anthracene, pyrene, chrysene and their substituted analogs. These compounds are constituents of coal tar. Only low levels of phthalates and other organic compounds were found in these samples.

Soil samples M1186 and M1187 also contained excessive levels of additional base/neutral extractable organic compounds. These are the compounds which were analyzed for in addition to base/neutral extractable compounds on the list of 127 priority pollutants. Both samples contained high levels of additional analogs of polynuclear aromatic hydrocarbons, especially derivatives of naphthalene. The other soil samples (M1243, M2050 and M2052) also contained some of these additional compounds but at comparatively lower levels. NJDEP's BISE has no established criteria for cleanup with respect to levels of these contaminants. However, some of these compounds are considered potentially carcinogenic.

Cyanides and total phenolics were detected at low levels in all soil samples but their concentrations did not exceed BISE's cleanup levels except for 15 ppm of cyanide in composite sample #1243.

Discrete soil sample M1186 and soil sample M2050 taken at 0-18" from the monitoring well site contained 18,000 and 23,000 ug/kg, respectively of PCBs. These levels are above the NJDEP-BISE's cleanup levels of 1-5 mg/kg for these parameters. PCBs included Aroclor 1254 in Sample M1186 and Aroclor 1260 in M2050. The other soil samples did not contain detectable levels of PCBs.

High levels of some of the pesticides were also found in soil samples M1187, M1243 and M2052. It was surprising to see higher levels of pesticides in soil sample M2052 which was taken at 8' to 10' depth from the monitoring well than in soil sample M2050 which was taken at 0-18" depth from the well site. Given the fact that DDT has very low water solubility and high affinity for absorption to soil, the possibility of surfacial contamination leading to leaching down to 8'-10' depth can be safely precluded. The data, however, indicates historical nature of contamination of the lower stratum at this site. As indicated earlier the data on levels of PCBs and

pesticides has been flagged as estimated concentrations, using EPA's system of codes for such flagging. This was done because the samples were analyzed by the laboratory past the time limit allowed under Federal Regulations 40 CFR part 136. Since this infringement is of a technical nature, the obtained data could be used to characterize the samples.

#### 4.2 Groundwater

Results of soil and water analyses of samples taken from the Newark Drive-In Theater property are presented in Table 6. The water sample (M1218) shows 7 ug/l (part per billion) of methyl benzene in the base/neutral/acid extractable fraction. This is much below the 50 ug/l concentration level established as cleanup level by NJDEP's Bureau of Industrial Site Evaluation (BISE). The well water sample also contained 3.1, 2.0, 0.83, 1.4, 7.8 and 29.0 ug/l of antimony, arsenic, cadmium, chromium, copper and zinc, respectively. These data indicate that levels of arsenic, cadmium, chromium, copper and zinc are below the levels established by N.J.A.C. groundwater quality standards. There are no criteria to judge the levels of antimony by.

#### 4.3 Summary

The overall data indicate that this site is contaminated with metals, base/neutral and acid extractable organic compounds, PCBs and pesticides and will require remedial action. The contamination seems to be both surficial resulting from dumping of priority pollutants as well as of historical nature. That the well water sample does not contain appreciable levels of these contaminants is related to the fact that most of these compounds would tend to remain in soil at a soil-water interface due to their high soil adsorption characteristics and low water solubility. Again, due to their high soil adsorption coefficients these compounds do not migrate much with the water in the soil.

The full laboratory analysis reports (NJDEP Tier II format) have been reviewed by our QA Coordinator and are maintained in our document control system. They are available for review upon request.

## 5.0 RECOMMENDATIONS

In view of the results of this report, further investigations will be necessary. These investigations should include estimating the extent of contamination and determining the most prudent and feasible solutions for construction on this property.